DOCKET: SAMH 100001000 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re			
INVENTOR:	Soon-Tae Ahn	EXAMINER:	S. Ip
SERIAL NO.:	10/521,285	ART UNIT:	1742
FILING DATE:	July 3, 2003	DATE:	June 29, 2007
FOR:	Quenched and Tempered Steel Wire with Superior Cold Forging Characteristics		

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL BRIEF FOR APPELLANT

This supplemental appeal brief is submitted in response to the notification of non-compliant appeal brief dated May 31, 2007.

This is an appeal from the final rejection by the Examiner mailed October 19, 2006, rejecting claims 1-4. A notice of appeal and the appeal fee were timely filed on January 17, 2007. Payment of $250.00 for the appeal brief fee (small entity) was previously made on March 14, 2007. Please charge any over or under payment to the assignee's Deposit Account No. 04-0566.

REAL PARTY IN INTEREST

The real party in interest is the assignee of all rights in this application, Samhwa Steel Co. Ltd., a corporation of Korea, having a place of business at 339-4, Samrak-Dong, Sasang-Gu, Pusan, Korea.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to appellant, appellant's legal representatives or assignee, which will directly affect or be affected by, or have a bearing on the Board's decision on this appeal.

STATUS OF CLAIMS

The subject application was filed on July 3, 2003 with claims 1-4. An amendment was filed on July 24, 2006, responsive to the office action mailed March 23, 2006, amending claim 1. In an office action mailed October 19, 2006, a final rejection was made of all of the claims in the application, to wit, claims 1-4. An amendment was made on December 12, 2006 to claim 1 to correct a spelling error, and this amendment was entered. All amendments have been entered and appellant is appealing the rejection of claims 1-4.

STATUS OF AMENDMENTS

All the amendments made during prosecution of the application have been entered and are presently in the application, including the amendment made after final rejection. The rejected claims 1-4 as they presently stand are set forth in the Appendix. A summary of the rejection of the claims may be found in the Office Action mailed October 19, 2006.

SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's invention as defined in independent claim 1 is directed to a quenched and tempered steel wire with superior cold forging characteristics, comprising 0.1 – 0.5 wt% of carbon (¶ 0019, line 2 and ¶ 0020, line 3), 1.0 wt% or less of silicon (¶ 0019, line 2 and ¶ 0021, line 8), 0.20 – 2.5 wt% of manganese (¶ 0019, line 3 and ¶ 0022, line 7), 0.03 wt% or less of phosphorous (¶ 0027, line 4), and 0.03 wt% or less of sulfur (¶ 0027, line 4), with the balance being iron and inevitable impurities (¶ 0019, line 3). The wire has tensile strength in a range of 700-1300 Mpa (¶ 0017, line 7) and a structure of a martensite base[1] and carbides precipitated therefrom, with a percent spheroidization of carbides[2] not less than 30% (¶ 0017, line 8, ¶0030, lines 7-11 and ¶ 0037, lines 1-10 and Fig. 3b).

As defined in claim 2, the quenched and tempered steel wire may further comprise at least one component selected from among 0.05 – 2.0 wt% of chromium (¶ 0019, lines 3-6, ¶ 0023, line 7 and ¶ 0024, lines 1-5), 0.05 – 1.5 wt% of molybdenum (¶ 0019, lines 3-6, ¶ 0024, line 6 and ¶ 0025, lines 1-4) and 0.0003 – 0.0050 wt% of boron (¶ 0019, lines 3-6, ¶ 0025, line 5 and ¶ 0026, lines 1-3).

---

[1] Martensite is a needle-like microstructure formed in the steel after rapid cooling from a high, austenitic temperature. *See*, specification, ¶ 0030, lines 7-9 and ¶ 0037, lines 1-10; and Fig. 3a. *See also*, Kanisawa et al. U.S. Patent No. 6,547,890, column 1, lines 51-54, column 3, lines 19-21, column 4, lines 23-27 and column 6, lines 8-11, and Fig. 2a.

[2] Spheroidization of carbides precipitated from the martensite is measured by the formula given in the specification at ¶ 0035, lines 1-5 and shown by the long direction length L and short direction length S in Fig. 2. An example is shown in Fig. 3b with both needle-shaped martensite and spheroidized carbides present. See ¶ 0037, lines 1-10.

The claimed invention, as defined in claims 3 and 4, is also directed to the aforedescribed quenched and tempered steel wire, drawn (¶ 0047, lines 1-3 and ¶ 0048, lines 1-4; and p. 11, Table 3).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The contested issues in this appeal are whether claims 1-4 are obvious to one of ordinary skill in the art from Kanisawa et al. U.S. Patent No. 6,547,890.[3]

ARGUMENT

I. Prior Art

The purpose of the Kanisawa patent is to "provide a steel wire rod for cold forging which can be spheroidizing-annealed in an as hot rolled state without preliminary drawing and rendered highly ductile through the spheroidizing annealing ... ." Kanisawa, column 1, lines 61-64. Kanisawa teaches that to achieve the good spheroidized structure, "a bainite or martensite structure containing evenly distributed carbon was the most suitable for the purpose." Kanisawa, column 2, lines 7-8. Kanisawa describes this further:

> The present invention, which is accomplished on the basis of the above discovery, forms fine crystal grains by means of low temperature rolling and a martensite, bainite or bainite-martensite structure by means of rapid cooling, and thus disperses carbon and reduces the distance of carbon diffusion during the spheroidizing annealing so as to facilitate the carbon diffusion.

Kanisawa, column 3, lines 56-63. While Kanisawa discusses both the martensite/

---

[3] While claim 4 is stated on the cover sheet of the October 19, 2006 Office Action as being rejected, the Examiner makes no mention of this claim in the body of the Office Action. Appellant assumes that claim 4 is rejected on the same basis as claims 1-3.

bainite structure in the same sentence as spheroidizing annealing, the reference to the latter is a separate, later process that transforms and eliminates the martensite/bainite structure, and does not provide both martensite and spheroidized carbides in the same structure at the same time. The Kanisawa patent provides a hot rolled and tempered wire that enables, with no preliminary drawing, easier subsequent spheroidizing annealing by controlling the microstructure as martensite, bainite, or bainite-martensite. *See* Kanisawa, column 6, lines 8-11 and 18-21. Fig. 2(a) shows the martensitic structures of the hot-rolled materials of the Kanisawa invention before spheroidizing annealing, while Fig. 3(b) shows the materials after spheroidizing annealing. This is confirmed in the Kanisawa specification at column 3, lines 19-28 and column 4, lines 23-51.

The Kanisawa patent teaches the production of wire rod by the sequential steps of low temperature rolling, rapid cooling, and tempering to achieve the martensite, bainite, or bainite-martensite structure. *See* Kanisawa, column 5, line 62 through column 6, line 41. The wire rod may then be subject to spheroidizing annealing. See Kanisawa, Example 1, column 6, lines 49-67. Kanisawa's Table 3 confirms this by describing the microstructure of the as-rolled material in the "inventive specimens" as "M" (martensite) or "Zw" (bainite). No spheroidized carbides are indicated in the as-rolled structure. The degree of spheroidizing given for these same specimens is only after spheroidizing annealing, and is not a description of the microstructure of the as-rolled material. See Kanisawa, column 6, line 52 through column 8, line 16. There is no martensite disclosed as remaining after annealing.

In summary, Kanisawa teaches that it is advantageous to begin with a martensite or bainite as rolled wire structure, before spheroidizing annealing the wire. Kanisawa

never discloses a quenched and tempered wire product in which martensite and spheroidized carbides are present in the material at the same time.

II. The Examiner's Rejections and Appellant's Arguments as to Non-Obviousness

A. Claims 1 and 2

The present invention describes in claims 1 and 2 a quenched and tempered steel wire that has a structure of a martensite base and carbides precipitated therefrom, with a percent spheroidization of carbides not less than 30%. The claimed steel wire is obtained by the process of "heating to a temperature of Ac3 transformation points or higher," "cool[ing] with water," and tempering by "heating temperature and time [ ] adjusted in the range of 200°C to Ac1 transformation points." ¶ 0043, lines 1-7. The present invention provides, with no conventional spheroidization annealing, a quenched and tempered steel wire which enables manufacture of a desired product with superior cold forging characteristics. ¶ 0040, lines 1-7, ¶ 0046, lines 1-5 and ¶ 0048, lines 1-4; and p.10, Table 2 and p. 11, Table 3; and Fig. 5. Important to obtaining these cold forging characteristics is the fact that the steel wire has a structure of martensite base with spheroidized carbide, with the percent spheroidization of carbides not less than 30%. ¶ 0017, line 8, ¶0030, lines 7-11 and ¶ 0037, lines 1-10 and Fig. 3b.

As described above, the sole cited reference, Kanisawa et al. U.S. Patent No. 6,547,890, fails to disclose the presence of spheroidized carbides with a martensite base in a quenched and tempered steel wire, as claimed in the instant application.

In the final rejection, the Examiner cites numerous cases[4] for the proposition:

> when prior art compounds essentially "bracketing" the claimed compound in structural similarity are all known, one of ordinary skill in the art would clearly be motivated to make those claimed compounds in searching for new products in the expectation that compounds similar in structure will have similar properties."

Office Action, p. 3. The Examiner also cites *In re Peterson*, 315 F.3d 1325, 1329-30, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003) for its statement that "[a] prima facie case of obviousness typically exists when the ranges of a claimed compound overlap the ranges disclosed in the prior art." Office Action, p.3. However, in the cited *May*, *Hoch*, and *Peterson* cases, the prior art did in fact disclose "bracketing" or "overlapping" ranges of compositions. That is not the case here. This case is more like the *Gyurik* case, wherein the CCPA reversed the Board and stated "[n]o common properties presumption rises from the mere occurrence of a claimed compound at an intermediate point in a conventional reaction yielding a specifically named prior art compound." *Gyurik*, 201 USPQ 557-58.

Appellant's claimed quenched and tempered steel wire as recited in claims 1 and 2 contains both the martensite base and minimum 30% spheroidized carbides. The only portions of the Kanisawa patent cited by the Examiner as disclosing martensite and spheroidizing in a steel alloy are column 2, lines 19-67 and Table 3. As discussed above, the martensitic microstructure and the spheroidized carbide microstructure are "before and after" microstructures. In other words, Kanisawa teaches only that one can have a martensite/bainite structure before heat-treating or a spheroidized carbide

---

[4] *In re Gyurik*, 596 F.2d 1012, 1018, 201 USPQ 552, 557, (CCPA 1979); *In re May*, 574 F.2d 1082, 1094, 197 USPQ 601, 611 (CCPA 1978); and *In re Hoch*, 57 CCPA 1292, 1296, 428 F.2d 1341, 1344, 166 USPQ 406, 409 (CCPA 1970).

structure after heat-treating. Since Kanisawa does not disclose or suggest how to achieve both at the same time, the Examiner has failed to make a *prima facie* case of obviousness against claims 1 and 2. MPEP §§ 2142 and 2143.03 ("To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.").

As shown above, the present invention shows a considerable difference compared to the prior art Kanisawa patent with respect to purpose and processing, and as a result has a different structure as well. Since the Kanisawa reference does not suggest a processing or heat treatment that provides a martensite base in a steel wire microstructure which also includes spheroidized carbides, this reference cannot render the present invention obvious to one of ordinary skill in the art.

B. Claims 3 and 4

Dependent claims 3 and 4 additionally recite that the quenched and tempered steel wire of claims 1 and 2, respectively, is drawn. The Examiner has not established *prima facie* obviousness since Kanisawa clearly teaches away from drawing the wire disclosed therein. As stated in Kanisawa,

> [T]he object of the present invention is to provide a steel wire rod for cold forging which can be spheroidizing-annealed in an as hot-rolled state without preliminary drawing and rendered highly ductile through the spheroidizing annealing, and a method to produce the same.

Kanisawa, column 1, lines 60-65. Kanisawa concludes:

> [I]t is possible to produce high quality annealed steel wire rods at high productivity and low cost, because the present invention makes the spheroidizing annealing viable without preliminary drawing, which has been conventionally an indispensable pretreatment for the spheroidizing annealing, and secures excellent ductility of the annealed materials.

Kanisawa column 9, lines 26-32. Accordingly, because Kanisawa teaches away from drawing appellant's claimed quenched and tempered steel wire with the claimed microstructure, one of ordinary skill in the art would not find the invention of claims 3 and 4 obvious.

CONCLUSION

For the reasons given above, appellant submits that the claims of the instant application are not obvious from the cited prior art, Kanisawa et al. U.S. Patent No. 6,547,890. Reversal of the rejections under 35 USC § 103 is respectfully requested.

Respectfully submitted,

Peter W. Peterson
Reg. No. 31,867

DeLIO & PETERSON, LLC
121 Whitney Avenue
New Haven, CT 06510-1241
(203) 787-0595

CLAIMS APPENDIX

Rejected Claims of Serial No. 10/521,285

1. (previously presented) A quenched and tempered steel wire with superior cold forging characteristics, comprising 0.1 – 0.5 wt% of C, 1.0 wt% or less of Si, 0.20 – 2.5 wt% of Mn, 0.03 wt% or less of P, and 0.03 wt% or less of S, with the balance being Fe and inevitable impurities, which has tensile strength in a range of 700-1300 Mpa and a structure of a martensite base and carbides precipitated therefrom, with a percent spheroidization of carbides not less than 30%.

2. (original) The quenched and tempered steel wire as defined in claim 1, further comprising at least one component selected from among 0.05 – 2.0 wt% of Cr, 0.05 – 1.5 wt% of Mo and 0.0003 – 0.0050 wt% of B.

3. (original) A quenched and tempered steel wire with superior cold forging characteristics, comprising the steel wire of claim 1 drawn.

4. (original) A quenched and tempered steel wire with superior cold forging characteristics, comprising the steel wire of claim 2 drawn.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None